

Plasma Surface Treatment System Components

Plasma Science Systems For Surface Cleaning and Modification

**PLASMA
SCIENCE**



Aluminum box chamber
high throughput production



Microprocessor touch screen controller
easy and precise operation



Patented electrode design
maximum process uniformity

Primary plasma design
most effective plasma exposure to all parts

MFC gas input/mixing
precise, reproducible gas mixing and distribution

RF auto matching network
reliable and efficient gas plasma generation



Turnkey vacuum system
readily integrated for the most efficient operation



Process Controller

Precise and easy control

The controller initiates program sequences and monitors process parameters. The highly sophisticated, microprocessor-based process controller with touch screen interface is designed to deliver guaranteed uniform and repeatable results in a user-friendly environment. The controller can store multiple programs for varied applications. Once programmed, the processing becomes automatic cycle after cycle with just the press of a button.

PROGRAM mode – Allows the setting and changing of process parameters through the touch screen.

AUTOMATIC mode – Key-lock after setting process parameters limits operation to AUTOMATIC mode (single button operation). This feature protects programs from unauthorized changes. System display screen retains available to the operator.

Operating in PROGRAM mode – Researchers and other R&D professionals may choose to operate in PROGRAM mode to address and modify individual process parameters *during* operation.

DIAGNOSTIC screens – Provide on-button vacuum pump and chamber leak-up measurements for valuable PM records and system performance evaluation.

Options - Remote system control RS232 or 485 via in-house factory automation.

Reactor Chamber

Maximum uniformity

In the reactor chamber, gas plasma is generated and parts are treated. Plasma Science systems utilize a patented electrode configuration (*US Patent no. 4,887,005, 5,190,703, 5,228,963, 5,733,511*) to ensure maximum uniformity and throughput.

Aluminum box configuration - Allows easy loading/unloading and maximizes volume usage in a fast and uniform processing environment.

Direct primary plasma exposure - All parts, or tray of parts placed on any of the shelves are exposed to direct primary plasma (the most reactive area of plasma).

Special configuration - PS-1010, PS-2020 and PS-3030 are quipped with special chambers designed for continuous treatment of spooled or flex materials. Key features include, removable dies and sheaves within the chamber to guide the material through the system, interleaf take-up and outlay, automatic product and breakage sensing, and variable roll speed control. All features can be modified to accommodate roll form materials in many sizes and shapes. Configurations for complete automatic feed-through and take-up spooling are also available.

Process gas distribution – For each system, particular attention was given to the design of process gas distribution for an even laminar flow throughout the chamber to ensure uniform treatment of high volume parts and materials.

RF Generator & Automatic Impedance Matching Network

Effective and efficient treatment

Solid state generators – Chosen for their ruggedness and reliability, the generators employ solid state technology that offers the greatest energy and cost-efficiency. The high frequency (13.56 MHz) RF excitation creates highly reactive and efficient gas plasma.

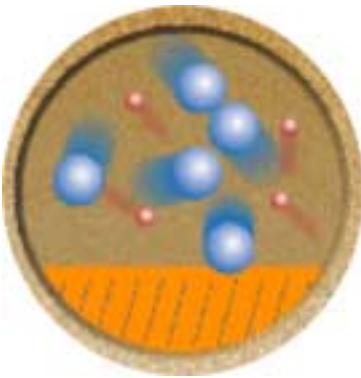
Automatic impedance matching network - The RF generator is coupled to an automatic impedance matching network, which allows the greatest efficiency across a wide range of process parameters.

Gas Control Module

Precise, reproducible gas mixing and distribution

Mass flow controllers - In a multi-sequence operation, precise control of several different gases can be crucial. Mass flow controllers are equipped in all systems to ensure precise and reproducible gas distribution and mixing. It is operated and monitored by the process controller.

Separate purge inlet line - An independent inlet line dedicated to purge or soft vent is designed to conveniently sweep the chamber of residual process gases prior to venting. This feature allows engineers to raise the chamber pressure to atmosphere with the inert gas of their choice. The ability to DOUBLE PUMP or pump and flush the chamber before venting to atmosphere also enhances operator safety.



Plasma Surface Modification

Vacuum System

Integrated turn key system

All vacuum pumps used in plasma systems should be specifically designed for the aggressive environments that exist within the plasma. The vacuum pumps selected by AST/Plasma Science engineers are well suited to meet these requirements.

System configuration – Pumps selected by AST/Plasma Science are configured for system interaction and completed as a totally integrated turnkey system. They can be directed and monitored from the main console while situated in a separate room isolated from the plasma system and the work area. This configuration, though not required, provides the most functional and efficient working conditions.

Safety & Self Diagnostics

Rigorous safety system and continuous self-diagnostics

A rigorous safety system is an integral part of all AST/Plasma Science system design. Often, a series of repeating interlocks is used to assure one safety feature. *RF power safety* - there are at least three preventive design elements built into each system to prevent RF from energizing while the chamber door is open. A door switch corresponding with DOOR OPEN signal on the front panel is interlocked with the RF power to prevent it from being turned on when the door is open.

A pressure switch disables the RF circuit while the chamber is at atmosphere. (The chamber must be at atmosphere for the door to be opened.) As a third measure, the hierarchical nature of the controller's software program prevents power from being turned on until pre-programmed set points are met.

Emergency power off - Emergency OFF buttons (EMO) are located on the console control panel of each system. Power interlocks also shut off main power to the system whenever any module or panel is removed.

Self-diagnostics - Each system is equipped with a built-in function to identify faults. During operation, the controller continuously monitors and displays key parameters. Should any system interlock or set-point range not be met, the system defaults to a HOLD condition, and an error message is displayed to assist in diagnosis.



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